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The Ferns of Washington

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OPHIOGLOSSUM. ADDER'S-TONGUE FAMILY.

Plants simple. Spore-leaf and foliage-leaf apparently with a common petiole below. Sporangia naked, in a spike or a panicle, opening at maturity by a transverse slit. Spores many, yellow. Thallus subterranean, without green.

KEY TO THE GENERA

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|--|----------------------|
| A. Foliage-leaf simple; veins netted. | OPHIOGLOSSUM (p. 97) |
| AA. Foliage-leaf pinnately or ternately divided or compounded; veins free. | BOTRYCHIUM (p. 98) |

OPHIOGLOSSUM. ADDER'S-TONGUE.

Plants rather fleshy; rootstocks erect, fleshy or tuberous. Foliage- and spore-leaf simple (ours); spore-leaf spike-like. Sporangia cohering along the 2 edges of the spike. Spores many, sulphur-yellow. (Greek *ophis* = a serpent, *glossa* = tongue; from the resemblance of the spore-bearing spike.) We have only the following species:

1. OPHIOGLOSSUM VULGATUM L. (*Pl. 6, f. 1.*)

Foliage-leaf entire, thin, ovate to elliptic, often oblanceolate, 1-4 inches long, narrowed at base, obtuse,

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sessile on the common petiole; basal veins 9-11, connected by cross veins above. Spore-leaf with petiole about as long as the common petiole. Sporangia large, coriaceous.—Washington to Arizona, Texas and Maine; Europe; Asia.

BOTRYCHIUM. GRAPE-FERN.

Plants fleshy; rootstocks short, erect, foliage- and spore-leaf compound, pinnately or ternately divided; spore-leaf 1-3-pinnate; veins free. Sporangia sessile or distinct, in rows on either side of the branches, forming large panicles in some. Spores of various shades of yellow. (Diminutive of Greek *botrys* = a cluster of grapes; from the resemblance of the spore-bearing leaf.)

- A. Leaf usually 1-pinnate (sometimes 2-pinnate in *B. lanceolatum*.)
 - B. Leaf-segments fan- or wedge-shaped.
 - C. Leaf-segments mostly in contact or overlapping, margin crenate to entire; stem very fleshy. 1. *B. lunaria*.
 - CC. Leaf-segments too far apart to touch each other, margin notched or incised; stem slender. 2. *B. Onondagense*.
 - BB. Leaf-segments oblong or lanceolate.
 - D. Outer leaf-segments lanceolate, acute. 3. *B. lanceolatum*.
 - DD. Leaf-segments oblong, obtuse. 4. *B. neglectum*.
- AA. Leaf ternately divided, divisions 1-3-pinnate.
 - E. Petiole slender; common petiole $\frac{1}{2}$ or more of entire length; foliage-leaf sessile. 5. *B. Virginianum*.
 - EE. Petiole robust; common petiole short; foliage-leaf not sessile. 6. *B. silaifolium*.

1. BOTRYCHIUM LUNARIA (L.) Sw. (*Pl. 6, f. 2.*)

Moonwort.

Plant very fleshy, 2-12 inches high. Foliage-leaf usually sessile, pinnate with 2-8 pairs of truncate or fan-shaped segments with crenate to entire margins. Spore-leaf 2-3-pinnate, often dense, 1-2 inches long, often about the height of the foliage leaf, its petiole shorter than the common petiole.—Washington to Colorado and Labrador and northward; Europe; Asia.

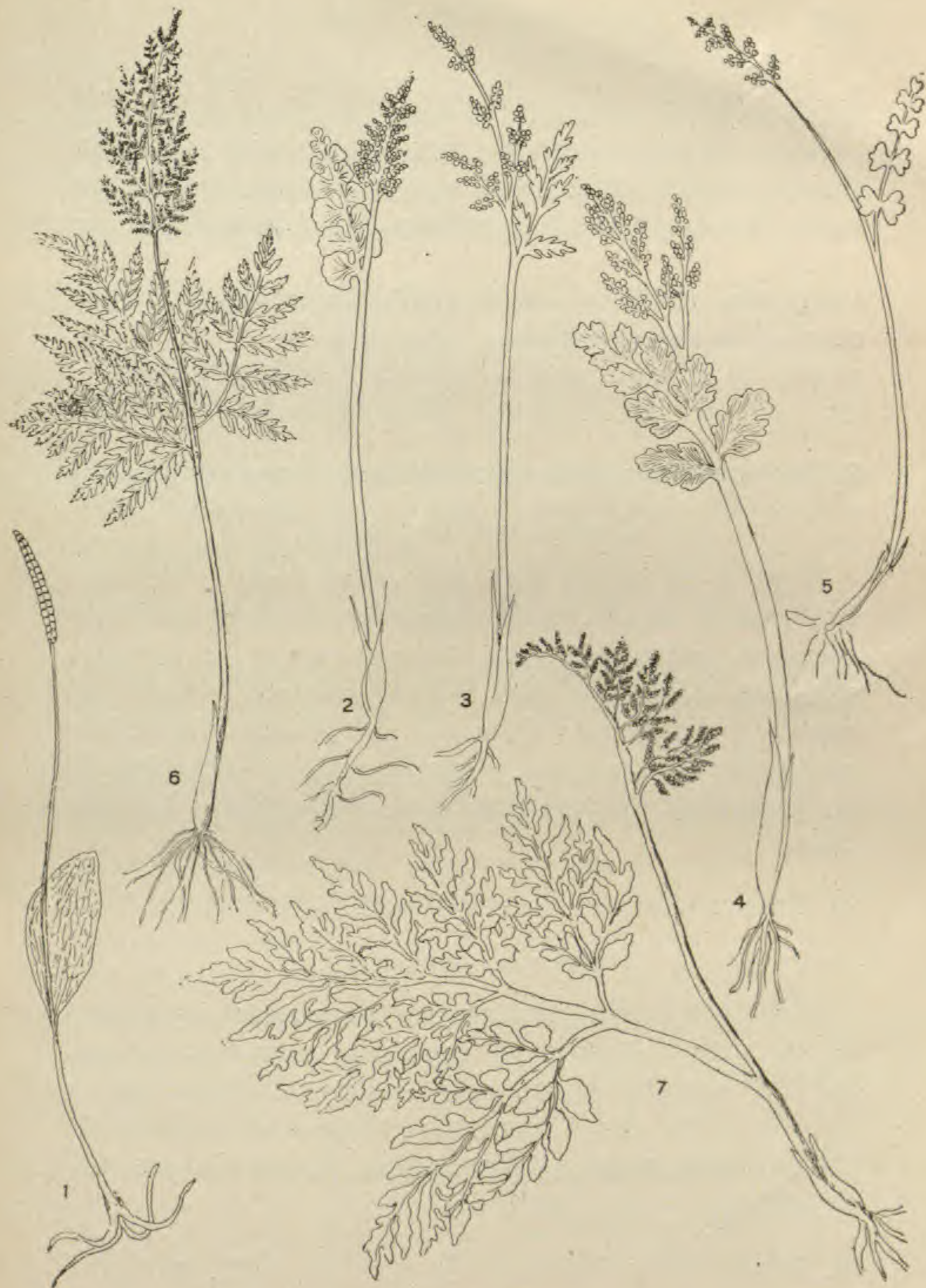


PLATE NO. 6.

- 1 = *Ophioglossum vulgatum*, $\times \frac{1}{2}$. 2 = *Botrychium lunaria*, $\times \frac{1}{2}$.
 3 = *Botrychium lanceolatum*, $\times \frac{1}{2}$. 4 = *Botrychium neglectum*, $\times \frac{1}{2}$.
 5 = *Botrychium Onondagense*, $\times \frac{1}{2}$. 6 = *Botrychium Virginianum*,
 $\times \frac{1}{4}$. 7 = *Botrychium silaifolium*, $\times \frac{1}{2}$.

2. *BOTRYCHIUM ONONDAGENSE* Underw. (*Pl. 6, f. 5.*)

Roots slender, from a very short axis; common petiole slender, rather weak and spreading, 3–7 inches high. Foliage-leaf short-petioled, $\frac{2}{5}$ –1-inch long, $\frac{1}{5}$ – $\frac{1}{2}$ -inch wide; leaf-segments 7–9, broadly cuneate, their own width or more apart, their outer margin notched or deeply incised. Spore-leaf $\frac{1}{2}$ –1 inch long, mostly 2-pinnate; petiole slender, 1–2 inches long.—On rocky ground in shade. Washington to New York.

3. *BOTRYCHIUM LANCEOLATUM* (Gmel.) Ångs. (*Pl. 6, f. 3.*)*Lance-leaved Grape-fern.*

Plant 3–12 inches high, somewhat fleshy. Foliage-leaf closely sessile, 1–2-pinnate or 3-lobed; ultimate segments lanceolate, acute, oblique, entire or dentate; mid-vein continuous with forking veinlets. Spore-leaf slightly overtopping foliage-leaf, 2–3-pinnate; its petiole much shorter than the common petiole.—Washington to Colorado, Pennsylvania and northward; Europe; Asia.

4. *BOTRYCHIUM NEGLECTUM* Wood. (*Pl. 6, f. 4.*)*Meriden Grape-fern.*

Plant 5–8 inches high, stout. Foliage-leaf 1-pinnate, short, with 3–4 pairs of segments; segments oblong, obtuse, erosely or incisely indented. Spore-leaf a panicle, often larger than the foliage-leaf.—Alaska to Nova Scotia, south to Washington, South Dakota and Maryland.

5. *BOTRYCHIUM VIRGINIANUM* (L.) Sw. (*Pl. 6, f. 6.*)*Rattlesnake Fern.*

Plant 4–24 inches high; stem relatively slender. Foliage-leaf sessile above middle of stem, ternate, broadly

triangular, thinly herbaceous; its main divisions short-stalked, 1-2-pinnate; ultimate segments toothed. Spore-leaf 2-3-pinnate.—British Columbia to Labrador, south to Washington, Arizona, Texas, Florida.

6. *BOTRYCHIUM SILAIFOLIUM* Presl. (*Pl. 6, f. 7.*)

Plant robust, 15-24 inches high. Foliage-leaf large, usually broader than long, with petiole 3-8 inches long, its 3 main divisions 2-3-pinnate; ultimate segments lobed, crenulate. Spore-leaf long-petioled, usually overtopping the foliage-leaf, 2-3-pinnate.—British Columbia and Washington.

POLYPODIACEAE. TRUE FERN FAMILY.

Plants terrestrial, perennial, evergreen or not. Leaves (fronds) growing from a rhizome in tufts or singly, 1-3 times divided into leaflets (pinnules) or lobes, coiled at tips when young, unrolling and growing at apex until mature. In most genera all the leaves are alike, other genera have distinct foliage- and spore-leaves. Spores very abundant, all alike, borne on backs of unmodified foliage-leaves or these somewhat modified but green, in sporangia which occur in groups (sori); sori may or may not be covered each by an indusium consisting either of a separate membrane or the in-rolled edge of the leaf. Thalli small, green, somewhat heart-shaped, on soil or decaying wood.

KEY TO THE GENERA—BASED ON THE LEAVES (See also p. 103)

- A. Leaves pinnately compound, their main divisions not 2 or 3.
- B. Leaves once pinnate or pinnately deep-lobed, tufted or scattered.
- C. Leaflets entire to serrate.
- D. Blades of the leaflets not narrowed to their midribs at base.
- E. Leaves not tufted, all alike; rootstocks creeping.
- 16. *POLYPODIUM*.
- EE. Leaves tufted, of 2 kinds; rootstocks not creeping.
- 8. *LOMARIA*.
- DD. Blades of the leaflets narrowed to their midribs at base.

- F. Leaves less than 1 inch wide, linear; leaflets ovate, obtuse or rounded, without lobe at base; petiole slender, shining smooth. 7. *ASPLENIUM*.
- FF. Leaves normally more than 1 inch wide when mature, linear or lanceolate; leaflets lanceolate to narrowly ovate, acute, with lobe at base on upper side; petiole not slender nor shining, scaly. 5. *POLYSTICHUM*.
- CC. Leaflets deeply toothed throughout their entire length.
- G. Blade of leaflet not narrowed to its midrib at base except sometimes the lower 1 or 2 pairs; leaf-blade triangular in general form. 3. *PHEGopteris*.
- GG. Blade of leaflet narrowed to its midrib at base.
- H. Leaf-blade obovate or oblanceolate; lower lobes of the leaflets longer than the others; leaflet-lobes rounded at tip; plant 1-2 feet high. 4. *DRYopteris*.
- HH. Leaf-blade ovate; lower lobes of the leaflets not longer than the others; leaflet-lobes acute at tip; plant 3-6 feet high. 9. *WOODWARDIA*.
- CCC. Lower leaflets lobed at base, all otherwise entire. 11. *PELLAEA*.
- BB. Leaves twice pinnate or pinnately deep-lobed, tufted.
- I. Plants 20 inches or less high.
- J. Leaf-blade triangular in general outline. 3. *PHEGopteris*.
- JJ. Leaf-blade lanceolate in general outline.
- K. Plants usually less than 8 inches high.
- L. Petiole coarse; leaflets smooth or covered with fine short inconspicuous white hairs. 1. *WOODSIA*.
- LL. Petiole very slender; leaflets densely covered with brown hairs. 12. *CHEILANTHES*.
- KK. Plants usually 8-20 inches high.
- M. Petiole very slender, hardly scaly at base. 2. *CYSTopteris*.
- MM. Petiole coarse, very scaly at base. 5. *POLYSTICHUM*.
- II. Plants over 20 inches high.
- N. Leaflets not contracted to their mid-veins where they join the main leaf-axis, or if so only the lower ones. 9. *WOODWARDIA*.
- NN. Leaflets contracted to their mid-veins where they join the main leaf-axis.
- O. Leaflets shining beneath; either leaf-blade wide at base or else lower pair of leaflet-lobes conspicuously larger than the others. 4. *DRYopteris*.
- OO. Leaflets not shining beneath; leaf-blade narrow at base; lower pair of leaflet-lobes not conspicuously larger than the others. 6. *ATHYRIUM*.
- BBB. Leaves thrice pinnate.
- P. Plants less than 1 foot high, densely tufted.
- Q. Leaves of 2 kinds. 13. *CRYPTOGRAMMA*.
- QQ. Leaves all alike.
- R. Leaf-blades triangular to pentagonal, whitish- or yellowish-powdery beneath. 10. *CEROpteris*.
- RR. Leaf-blade ovate to lanceolate, not powdery beneath.

- S. Petiole 2-5 times as long as the leaf-blade; lower side of leaflets not hairy. 13. CRYPTOGRAMMA.
- SS. Petiole not longer than the leaf-blade; lower side of leaflets covered with long brown hairs. 12. CHEILANTHES.
- PP. Plants over 1 foot high, tufted or not.
- T. Leaves not tufted, triangular, 14 feet or less high. 15. PTERIDIUM.
- TT. Leaves tufted, ovate to lanceolate, 4 feet or less high.
- U. Leaves broadly ovate, widest at base, 10-15 inches high. 4. DRYOPTERIS.
- UU. Leaves oblong-lanceolate, narrowed somewhat at base, 12-18 inches high. 3. PHEGopteris.
- AA. Main leaf-divisions 2 or 3, each again twice divided.
- V. Main leaf-division 3, each regularly bipinnate; leaflets or lobes not or hardly 1-sided.
- W. Leaves tufted, yellowish-powdery on the back; 2 lateral main leaf-divisions sessile or nearly so. 10. CEROPTERIS.
- WW. Leaves not tufted, not yellowish-powdery on the back; 3 main leaf-divisions each distinctly stalked.
- X. Leaves 8-18 inches high; leaflets not hairy. 3. PHEGopteris.
- XX. Leaves 1-14 feet high; leaflets somewhat hairy beneath. 15. PTERIDIUM.
- VV. Main leaf-divisions 2, each at once divided into few long branch-like parts bearing each several to many leaflets; leaflets very much 1-sided; leaves tufted. 14. ADIANTUM.

KEY TO THE GENERA—BASED ON THE SORI
(See also page 101)

- A. Indusium present, sori covered.
- B. Sori marginal, covered by modified edge of leaf (false indusium).
- C. Leaves all alike.
- D. Indusium continuous around margin or usually so; sporangia borne on leaf under false indusium; leaflets more or less bilaterally symmetrical.
- E. Leaves small, tufted; sori on terminal veins.
- F. Leaves 1-pinnate; indusium membranous. 11. PELLAEA.
- FF. Leaves 2-3-pinnate.
- G. Sterile leaflets brown-hairy; indusium not membranous. 12. CHEILANTHES.
- GG. Sterile leaflets not hairy; indusium membranous. 13. CRYPTOGRAMMA.
- EE. Leaves large, not tufted; sori on continuous veins connecting lateral veins. 15. PTERIDIUM.
- DD. Indusia not continuous with each other, oblong; sporangia borne on under side of false indusium; leaflets one-sided. 14. ADIANTUM.
- CC. Leaves of two kinds, spore-leaves unlike the foliage-leaves; sori oblong or round, confluent at maturity; two sides of leaflets meeting to form indusium when young, later opening out flat. 13. CRYPTOGRAMMA.
- BB. Sori not marginal, not covered by edge of leaf, a true indusium.
- H. Sori round.

- I. Indusium over sori.
 - J. Petioles more or less scaly; indusium conspicuous.
 - K. Indusium round, peltate; leaf-blades linear to lanceolate, tough. 5. POLYSTICHUM.
 - KK. Indusium cordate; leaf-blades obovate or oblanceolate with narrow base, or oblong or ovate with wide base, membranous. 4. DRYOPTERIS.
 - JJ. Petioles not scaly; indusium inconspicuous, hood-like; leaf-blade delicate, oblong to lanceolate. 2. CYSTOPTERIS.
- II. Indusium under sori; sori stellately divided; small tufted ferns growing on rocks; petioles coarse, woody. 1. WOODSIA.
- HH. Sori not round.
 - L. Sori oblong or linear; leaves all alike, pinnately divided.
 - M. Sori oblique to mid-vein, separate, not in depressions; leaves small. 7. ASPLENIUM.
 - MM. Sori parallel to mid-vein in chain-like rows in depressions; leaves large. 9. WOODWARDIA.
 - LL. Sori continuous in band next to midrib; leaves of two kinds, pinnately divided. 8. LOMARIA.
 - LLL. Sori curved, more or less circular; leaves all alike, bipinnate, narrowly ovate, narrow at base. 6. ATHYRIUM.
- AA. Indusium none, sori naked.
 - N. Sori elongated, spreading, following the veins; leaves triangular, 2-3-pinnate; lower surface covered with yellow to white powder. 10. CEROPTERIS.
 - NN. Sori round or elliptical, leaf-back not covered with powder.
 - O. Sori large, on tips of veins; leaves pinnately divided; petiole jointed to rootstock. 16. POLYPODIUM.
 - P. Leaf-blade triangular in general form and leaflets acute. 3. PHEGOPTERIS.
 - PP. Leaf-blade either not triangular in general form, or if so the leaflets rounded and quite blunt. 16. POLYPODIUM.
 - OO. Sori small, on backs of veins below apex; leaves ternate or 2-3-pinnate; petiole not jointed to rootstock. 3. PHEGOPTERIS.

1. WOODSIA.

Small tufted ferns growing mostly upon rocks; petioles coarse, woody; leaf-blades 2-pinnate. Indusium under the round sorus, stellately divided into lobes or fringes. (Honor of J. Woods, an English botanist.)

- A. Leaf-blades smooth; leaflets or lobes 4-6 pairs on each primary leaf-division; lobes of indusium hair-like. 1. *W. oregana*.
- AA. Leaf-blades hairy; leaflets or lobes 6-12 pairs on each primary leaf-division; lobes of indusium widest at base. 2. *W. scopulina*.

1. WOODSIA OREGANA Eat. (*Pl. 6, f. 1, 2.*)

Leafy in appearance. Petiole equal in length to blade; leaf-blade smooth, lanceolate, partly 2-pinnate,

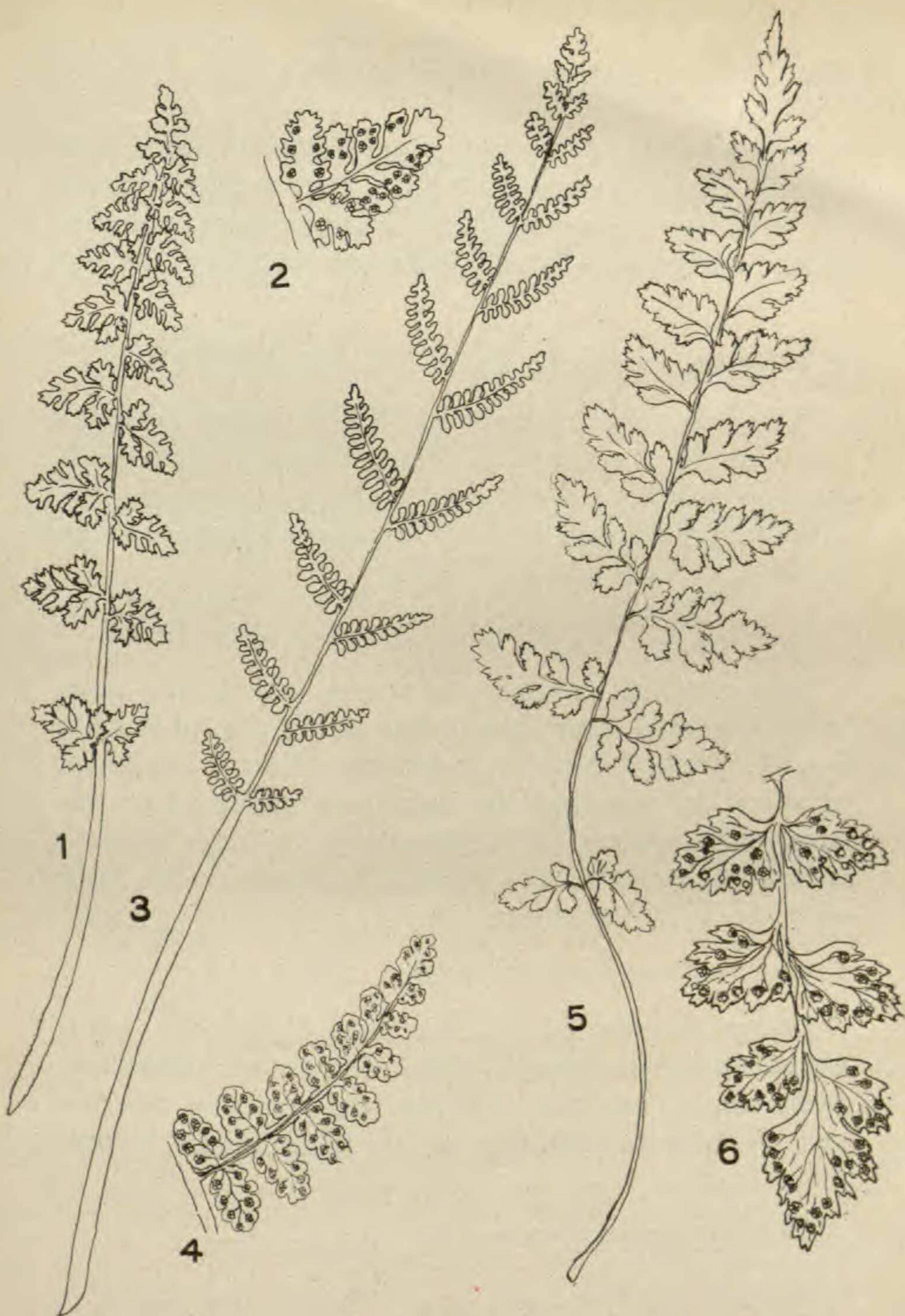


PLATE NO. 7.

1, 2 = *Woodsia oregana*; 1 = a leaf, $\times \frac{1}{2}$; 2 = a primary leaf-division, $\times 1$. 3, 4 = *Woodsia scopulina*; 3 = a leaf, $\times \frac{1}{2}$; 4 = a primary leaf-division, $\times 1$. 5, 6 = *Cystopteris fragilis*; 5 = a leaf, $\times \frac{1}{4}$; 6 = a primary leaf-division, $\times 1$.

2–5 inches long, $\frac{1}{2}$ – $\frac{3}{4}$ inch wide; leaflets or lobes 4–6 pairs on each primary leaf-division, their margin toothed or crenate. Indusium very inconspicuous, fringed nearly to center.—British Columbia to Great Lakes, south to California, Arizona and Nebraska.

2. *WOODSIA SCOPULINA* Eat. (*Pl. 7, f. 3, 4.*)

Petiole 2–4 inches long; leaf-blades hairy, ovate to lanceolate, 1–2-pinnate, 3–6 inches long; leaflets 6–12 on each primary leaf-division, toothed to crenate. Indusium very delicate, its lobes broadest at base.—Alaska to Ontario, Colorado and California.

2. *CYSTOPTERIS (FILIX)*. BLADDER FERN.

Leaves tufted; blade 2–3-pinnate; leaflets and large lobes toothed; veins free. Sori round, on back of a straight fork of a vein; indusium delicate, hood-like, attached by wide base on inner side partly under the sorus, early opening. (Greek *kystis* = a bladder, *pteris* = a fern; referring to the inflated indusium.) We have only the following species:

1. *CYSTOPTERIS FRAGILIS* Bernh. (*Pl. 7, f. 5, 6.*)

Leaves delicate, 3–12 inches long, blade and petiole about equal in length; blade oblong to lanceolate; veins free. Indusium tapering and acute on the free side.—Alaska to Labrador, south to California, Kansas and Georgia.

3. *PHEGOPTERIS*. BEECH FERN.

Medium-sized or small ferns. Petiole not jointed to rootstock; leaf-blades ternate or 2–3-pinnate. Sori small, round, on the backs of the veins below the apex; indusium wanting. (Greek *phegos* = a beech or oak, *pteris* = fern; probably from the lobing of the leaflets.)



PLATE NO. 8.

1, 2 = *Phegopteris Phegopteris*; 1 = a leaf, $\times \frac{1}{2}$; 2 = a portion of a leaflet, $\times 1\frac{1}{2}$. 3, 4 = *Phegopteris Dryopteris*; 3 = a leaf, $\times \frac{1}{2}$; 4 = a leaflet or leaf-lobe, $\times 1\frac{1}{2}$. 5, 6 = *Phegopteris alpestris*; 5 = a primary leaf-division, $\times 1$; 6 = a leaflet or leaf-lobe, $\times 1\frac{1}{2}$.

- A. Leaf-blades of 3 nearly equal divisions, triangular, very thin; each division stalked and 1-3-pinnate 1. *P. Dryopteris*.
- AA. Leaf-blades not of 3 nearly equal divisions, not very thin.
 - B. Leaf-blades oblong to lanceolate, 3-pinnate; rachis not winged. 2. *P. alpestris*.
 - BB. Leaf-blades triangular, 1-2-pinnate; rachis winged. 3. *P. Phegopteris*.

1. PHEGOPTERIS DRYOPTERIS (L.) Fée. (*Pl. 8, f. 3, 4.*)

Oak Fern.

Rootstock slender, creeping. Leaves 12-18 inches long; blade thin, 6-10 inches wide, composed of 3 almost equal divisions, glabrous or nearly so; primary leaf-divisions again 1-2-pinnate, triangular, acute, their leaflets or lobes crenate or entire. Sori small, round, near edge of the leaflets or lobes.—In damp shady forests. Alaska to New Foundland, south to Oregon, Colorado and Virginia.

2. PHEGOPTERIS ALPESTRIS (Hoppe) Mett. (*Pl. 8, f. 5, 6.*)

Leaves tufted, 1-2 feet long; blade 2-4 inches wide, oblong to lanceolate, acuminate, 3-pinnate. Sori numerous.—British Columbia to Montana and California.

3. PHEGOPTERIS PHEGOPTERIS (L.) Underw. (*Pl. 8, 5, 6.*)

Rootstock slender, creeping, scaly. Leaves 6-18 inches long; blade triangular, acuminate, 4-6 inches wide, 2-pinnate, pubescent specially on veins beneath; rachis winged. Sori near margin of leaflets.—Alaska to Labrador, south to Washington, Iowa and Virginia.

(*To be Continued.*)